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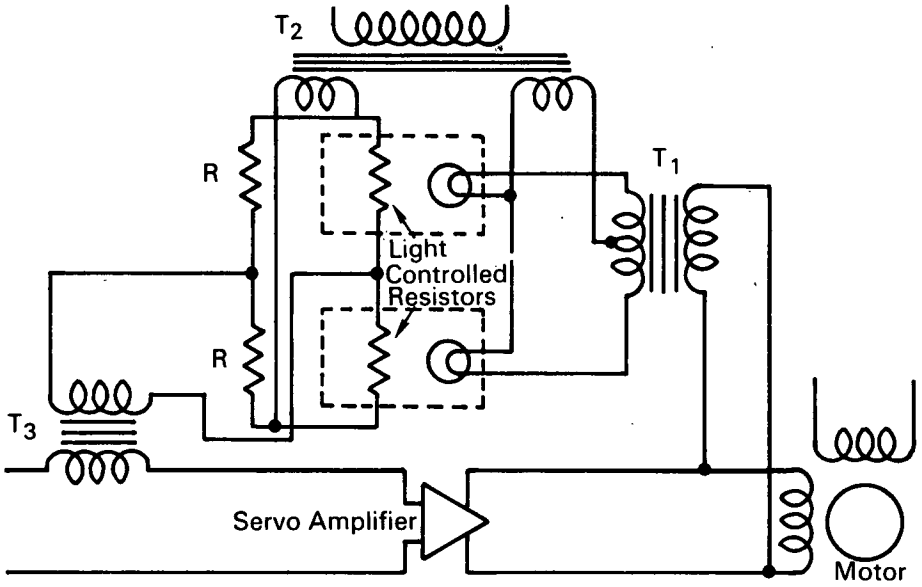
NASA TECH BRIEF

Light-Controlled Resistors Provide Quadrature Signal Rejection for High-Gain Servo Systems



The problem:

To develop a simple, reliable servo amplifier feedback circuit to reduce the quadrature components at the output of a high-gain servo system. Quadrature signal components may cause overheating of the servo motor, and thus they must be eliminated before passing through the final servo amplifier.

The solution:

A servo amplifier feedback system, in which the phase sensitive detection, low pass filtering, and multiplication functions required for quadrature rejection, are performed by light-controlled photoresistors.

How it's done:

The voltage applied to the servo motor is also applied to the transformer T_1, and is added vectorially to the output of T_2 in a bridge circuit. Any quadrature signal component existing in the motor drive voltage causes an unbalance in the light-controlled resistor bridge circuit. When the quadrature voltage is zero, the respective voltages to the lamps in the light-controlled resistors are equal and both the light-controlled resistor bridge and resistor bridge are balanced.

When a quadrature component does exist in the servo loop, the vector relationships produce unequal magnitudes of voltages to the lamps, and the light-controlled resistor bridge becomes unbalanced. This unbalance causes a corresponding unbalance in the resistor bridge and applies a quadrature voltage to the transformer T_3. Transformer T_3 is connected so that the quadrature voltage applied to the error volt-

(continued overleaf)

age is in opposite phase with respect to the quadrature component of the error signal, and they therefore cancel each other.

Notes:

1. This quadrature rejection circuit provides other advantages in addition to the reduction in the complex circuitry normally required for high-gain servo feedback systems. These advantages are: increased gain, improvement of signal-to-noise ratio, and elimination of necessity for compensation.
2. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Western Support Office
   150 Pico Boulevard
   Santa Monica, California 90406
   Reference: B67-10552

Patent status:

No patent action is contemplated by NASA.

Source: D. D. McCauley
of Philco
under contract to
Western Support Office
(WSO-340)